

CLAIMS

1. An efficient system for determining if a paging channel should be received
2 and processed via a wireless communications device based on a quick paging channel
in a wireless communications system comprising:

4 first means for receiving an electromagnetic signal including pilot signal and
quick paging signal components;

6 second means for providing one or more initial quality parameters indicative
of a quality of a signal environment in which said electromagnetic signal is
8 propagating based on said pilot signal, said one or more initial quality parameters
associated with a first symbol of said quick paging signal;

10 third means for ascertaining whether a second symbol of said quick paging
channel signal or said subsequent paging channel should be processed based on said
12 one or more initial quality parameters and providing a first indication in response
thereto; and

14 fourth means for determining if said subsequent paging channel should be
processed based on a second quality parameter and a combined decision metric
16 associated with both said first symbol and said second symbol when said first
indication indicates that said second symbol should be processed and providing a
18 second indication response thereto.

2. The system of Claim 1 wherein said subsequent paging channel is a
2 primary paging channel, and said wireless communications device is a dual paging
channel wireless communications system.

3. The system of Claim 1 wherein said quick paging channel signal includes a
2 dual slot having said first symbol and said second symbol.

4. The system of Claim 3 wherein said third means includes means for
 2 comparing a first quality parameter of said one or more initial quality parameters to a
 first comparison threshold and providing said first indication in response thereto.

5. The system of Claim 4 wherein said first quality parameter (CSI_1) is
 2 computed in accordance with the following equation:

$$4 \quad CSI_1 = \frac{E_{pilot1}}{\hat{I}_{o1}},$$

6 where E_{pilot1} is the energy of the portion of said pilot signal that is received
 simultaneously with said first symbol, and \hat{I}_{o1} is total the energy of the portion of said
 8 received electromagnetic signal, including noise and interference, received
 simultaneously with said first symbol.

6. The system of Claim 5 wherein said third means further includes means for
 2 providing a third indication indicative as to whether said wireless communications
 device should be placed in a sleep state based on a comparison of a first decision
 4 metric to a second decision threshold.

7. The system of Claim 6 wherein said first decision metric (D_1) is described
 2 by the following equation:

$$4 \quad D_1 = \frac{QP_1}{E_{pilot1}},$$

6 where D_1 is said first decision metric; QP_1 is a dot product, cross product, or a
 combination thereof of said first symbol with an estimate of said pilot signal
 8 associated with said first symbol; and E_{pilot1} is an energy of said pilot signal associated
 with said first symbol.

8. The system of Claim 6 wherein said third means further includes means for
 2 placing said wireless communications device in a sleep state when said third
 indication indicates that said wireless communications device should be placed in a
 4 sleep state.

9. The system of Claim 8 wherein said third means further includes means for
 2 comparing a third quality parameter to a fourth decision threshold when said third
 indication indicates that said wireless phone should not be immediately placed in a
 4 sleep state and providing said first indication in response thereto.

10. The system of Claim 9 wherein said third quality parameter is
 2 representative of an energy of said pilot signal associated with said first quick paging
 channel signal.

11. The system of Claim 8 wherein said fourth means includes means for
 2 using said second quality parameter and a fourth comparison threshold to provide said
 second indication.

12. The system of Claim 11 wherein said second parameter (CSI_2) is
 2 computed in accordance with the following equation:

$$4 \quad CSI_2 = \frac{E_{pilot2}}{Io_2}$$

6 where Io_2 is a total received signal energy of a first portion of said received
 electromagnetic signal associated with said second symbol; E_{pilot2} is an estimate of
 8 the energy of said pilot signal associated with said first portion.

13. The system of Claim 12 wherein said one or more combined decision
 2 metrics includes the following metric (D):

$$D = \frac{\frac{QP_1}{\sigma_1^2} + \frac{QP_2}{\sigma_2^2}}{\frac{E_{pilot1}}{\sigma_1^2} + \frac{E_{pilot2}}{\sigma_2^2}},$$

where σ_1^2 is the noise power associated with a first portion of said received signal containing said first symbol; σ_2^2 is the noise power associated with a second portion of the received signal containing said second symbol; QP_1 is a dot product, cross product, or a combination thereof of said first symbol with an estimate of said pilot signal associated with said first symbol; and QP_2 is a dot product, cross product, or a combination thereof of said second symbol with an estimate of said pilot signal associated with said second symbol, E_{pilot1} is an energy of said first portion of said pilot signal; and E_{pilot2} is an energy of said second portion of said pilot signal.

14. An efficient system for determining if a primary paging channel should be received and processed via a wireless communications device based on a quick paging channel in a wireless communications system comprising:

first means for receiving an electromagnetic signal including pilot signal and quick paging signal components;

second means for providing a first quality parameter, a first decision metric, and a second quality parameter, said first quality parameter indicative of a quality of a signal environment in which said electromagnetic signal is propagating based on said pilot signal, said first decision metric indicative of a value of said first symbol, and said third quality parameter indicative of an energy of said pilot signal, said first quality parameter, said first decision metric, and said second quality parameter associated with a first symbol of said quick paging signal;

third means for ascertaining whether a second symbol of said quick paging channel signal or said primary paging channel should be processed based on said first quality parameter, said first decision metric, and said third quality parameter, and providing a first indication in response thereto; and

fourth means for determining if said subsequent paging channel should be
18 processed based on a fourth quality parameter and one or more combined decision
metrics associated with both said first symbol and said second symbol when said first
20 indication indicates that said second symbol should be processed and providing a
second indication response thereto.

15. An efficient wireless communications device adapted for use with a
2 wireless communications network employing a quick paging channel and a primary
paging channel comprising:
4 a transceiver for receiving receive signals and transmitting transmit signals;
a processor for processing said receive signals and controlling said transceiver,
6 said processor including a system for selectively receiving and processing said
primary paging channel in response to said quick paging channel, said system
8 including first means for receiving an electromagnetic signal that includes pilot signal
and quick paging signal components; second means for providing a first quality
10 parameter indicative of a quality of a signal environment in which said
electromagnetic signal is propagating based on said pilot signal, said first parameter
12 associated with a first symbol of said quick paging signal; third means for checking
whether a second symbol of said quick paging channel signal or said primary paging
14 channel should be processed based on said first quality parameter and providing a first
indication in response thereto; and fourth means for determining if said primary
16 paging channel should be processed based on a second quality parameter and based
on one or more combined decision metrics associated with both said first symbol and
18 said second symbol when said first indication indicates that said second symbol
should be processed and providing a second indication response thereto; and
20 a controller running on said processor for selectively processing said primary
paging channel and establishing any subsequent traffic channels specified via said
22 primary paging channel in response to said first indication and/or said second
indication of said system.

16. An efficient system for determining if a paging channel should be received and processed via a wireless communications device based on a quick paging channel in a wireless communications system comprising:

first means for receiving and demodulating a receive signal, said receive signal including a pilot channel signal associated with a first symbol of a quick paging channel signal of said quick paging channel and providing a pilot energy value representative of an energy of said pilot channel signal;

second means for computing a normalized pilot energy based on said pilot energy value and a total energy value associated with said receive signal and said first symbol;

third means for calculating a first decision metric based on said first symbol, said pilot channel signal, and said pilot energy value;

fourth means for comparing said normalized pilot energy to a first erasure threshold and providing a first erasure indication in response thereto;

fifth means for selectively comparing said first decision metric to a first on-off threshold when said first erasure indication indicates no erasure and providing a first on-off indication in response thereto;

sixth means for directly comparing said pilot energy value to a second on-off threshold when said first on-off indication indicates on and/or when said first erasure indication indicates erasure and providing a second on-off indication in response thereto;

seventh means for employing said first means and said second means to provide a second pilot energy value and a second carrier to signal interference ratio both associated with a second symbol of said quick paging channel signal, when said second on-off indication indicates off;

eighth means for comparing said second normalized pilot energy to a second erasure threshold and providing a second erasure indication in response thereto;

ninth means for computing a second decision metric or a third decision metric based on first and second noise power estimates each associated with said first quick paging channel symbol and said second quick paging channel symbol, respectively;

based on combined symbol and pilot energies for the first and second quick paging
32 channel symbols, respectively; and based on said first pilot energy and a second pilot
energy associated with said first and second quick paging channel symbols,
34 respectively, said ninth means activated when said second erasure indication indicates
no erasure;

36 tenth means for comparing said first or second decision metric to a third on-off
threshold and providing a third on-off indication in response thereto;

38 eleventh means for selectively placing said wireless communications device in
a sleep state when said first on-off indication indicates off and/or when said third on-
40 off indication indicates off;

twelfth means for selectively receiving and processing said primary paging
42 channel when said third on-off indication indicates on, said second erasure indication
indicates erasure, and/or said second on-off indication indicates on.

17. A system for determining, via a quick paging signal associated with a
2 quick paging channel, whether a forthcoming page on a primary paging channel
should be received and processed comprising:

4 first means for receiving an electromagnetic signal and providing one or more
decision parameters based on a quality of a signal environment through which said
6 received signal propagates and/or based on a value of a first symbol and/or a second
symbol of a quick paging channel signal component of said received signal in
8 response to the receipt of said electromagnetic signal and

second means for selectively comparing said one or more decision parameters
10 associated with a first quick paging channel symbol and/or a second paging channel
symbol to one or more corresponding predetermined thresholds in response to said
12 control signal and providing a first indication in response thereto, said first indication
indicative of whether said forthcoming paging channel should be received and
14 processed.

18. An efficient method for determining if a paging channel should be received and processed via a wireless communications device based on a quick paging channel in a wireless communications system comprising the steps of:

receiving an electromagnetic signal including pilot signal and quick paging signal components;

providing a first quality parameter indicative of a quality of a signal environment in which said electromagnetic signal is propagating based on said pilot signal, said first quality parameter associated with a first symbol of said quick paging signal;

ascertaining whether a second symbol of said quick paging channel signal or said subsequent paging channel should be processed based on said first quality parameter and providing a first indication in response thereto; and

determining if said subsequent paging channel should be processed based on a second quality parameter and one or more combined decision metrics associated with both said first symbol and said second symbol when said first indication indicates that said second symbol should be processed and providing a second indication response thereto.

19. A system for interpreting a quick paging channel signal in a wireless communications system comprising:

first means for analyzing a received signal and a signal environment associated with said quick paging channel to determine if one or more symbols of said received signal are valid and providing a first indication in response thereto and

second means for providing a value indicative of a message included in said quick paging channel based on said first indication and said one or more symbols.

20. The system of Claim 19 wherein said one or more symbols include a first symbol and a second symbol.

21. The system of Claim 20 wherein said first means includes means for
 2 analyzing said signal environment and providing a parameter indicative of said signal
 environment via a pilot signal included in said received signal.

22. The system of Claim 21 further including third means for indicating that
 2 said first symbol and said second symbol are unreliable based on said parameter and
 selectively disabling said second means in response thereto.

23. The system of Claim 21 wherein said second means includes means for
 2 selectively calculating one or more of the following metrics (D_1 or D):

$$4 \quad D_1 = \frac{QP_1}{E_{pilot1}}, \quad D = \frac{\frac{QP_1}{\sigma_1^2} + \frac{QP_2}{\sigma_2^2}}{\frac{E_{pilot1}}{\sigma_1^2} + \frac{E_{pilot2}}{\sigma_2^2}},$$

6 where σ_1^2 is the noise power associated with a first portion of said received signal
 containing the first symbol; σ_2^2 is the noise power associated with a second portion of
 8 the received signal containing the second symbol; QP_1 is a dot product, cross product,
 or a combination thereof of said first symbol with an estimate of said pilot signal
 10 associated with said first symbol; QP_2 is a dot product, cross product, or a
 combination thereof of said second symbol with an estimate of said pilot signal
 12 associated with said second symbol, E_{pilot1} is an energy of said first portion of said
 pilot signal; and E_{pilot2} is an energy of said second portion of said pilot signal.

24. The system of Claim 21 wherein said second means includes means for
 2 comparing one or more of said metrics to one or more predetermined thresholds and
 providing said value in response thereto.

25. A system for interpreting a quick paging channel signal in a wireless
 2 communications system comprising:

- a receiver circuit having an antenna and a receive chain;
4 a pilot estimation circuit in communication with said receiver;
a total received energy computation circuit in communication with said
6 receiver;
a quick paging channel symbol combiner in communication with said pilot
8 estimation circuit, said total received energy computation circuit, and said receiver;
and
10 a page detector in communication with said quick paging channel symbol
combiner.

26. The system of Claim 25 wherein said receiver further includes a sample
2 random access memory (RAM) connected at an output of said receive chain, an
interpolator connected at an output of said sample random access memory, a
4 despreading circuit.

27. The system of Claim 26 wherein said despreading circuit includes a
2 demodulator.

28. The system of Claim 26 wherein said sample RAM and said interpolator
2 are included in a digital baseband processor.

29. The system of Claim 28 wherein said pilot estimation circuit includes a
2 pilot estimator in communication with a pilot energy computation circuit.